

1 1. A method comprising:
2 forming a lower electrode;
3 covering the lower electrode with a protective
4 layer; and
5 forming a phase change material over said lower
6 electrode.

1 2. The method of claim 1 further comprising:
2 defining a singulated opening;
3 forming a cup-shaped phase change material in
4 said opening; and
5 forming a thermally insulating material in the
6 cup-shaped phase change material.

1 3. The method of claim 2 including defining said
2 phase change material using a planarization process.

1 4. The method of claim 3 including defining said
2 phase change material using a chemical mechanical
3 planarization technique.

1 5. The method of claim 2 including defining a
2 sidewall spacer in said singulated opening.

1 6. The method of claim 5 including defining an
2 electrode in said opening.

1 7. The method of claim 6 including using said
2 sidewall spacer to define the cup-shape of said phase
3 change material.

1 8. The method of claim 6 including forming a base
2 layer over a substrate and forming said lower electrode
3 over said base layer.

1 9. The method of claim 1 including sequentially
2 forming said lower electrode and then said protective
3 layer.

1 10. The method of claim 9 including etching said
2 lower electrode and said protective film using the same
3 mask.

1 11. A memory comprising:
2 a lower electrode;
3 a protective layer over said electrode; and
4 a phase change material over said lower
5 electrode.

1 12. The memory of claim 11 further comprising:
2 a support structure;

3 an insulator over said support structure, said
4 insulator having an opening defined in said insulator;
5 a cup-shaped phase change material in said
6 opening; and
7 a thermally insulating material in said cup-
8 shaped phase change material.

1 13. The memory of claim 12 wherein said thermally
2 insulating material fills said cup-shaped phase change
3 material.

1 14. The memory of claim 11 wherein said phase change
2 material is singulated.

1 15. The memory of claim 12 including a sidewall
2 spacer in said singulated opening.

1 16. The memory of claim 15 wherein said electrode is
2 located in said opening.

1 17. The memory of claim 16 wherein said cup-shaped
2 phase change material is formed over said sidewall spacer.

1 18. The memory of claim 11 wherein said protective
2 layer includes a material of the form Si_xN_y .

1 19. The memory of claim 18 wherein x is equal to
2 three and y is equal to four.

1 20. The memory of claim 11 wherein said lower
2 electrode is formed of carbon.

1 21. The memory of claim 11 including a base layer
2 below said lower electrode.

1 22. The memory of claim 11 wherein said protective
2 layer is an insulator.

1 23. The memory of claim 11 wherein said protective
2 layer includes a central opening and said phase change
3 material extends through said central opening to said lower
4 electrode.

1 24. . A memory comprising:
2 a substrate;
3 a lower electrode formed over said substrate;
4 a phase change material covering a portion of
5 said lower electrode; and
6 a protective layer extending over a portion of
7 said lower electrode not covered by said phase change
8 material.

1 25. The memory of claim 24 wherein said protective
2 layer includes a central opening and said phase change
3 material contacts said lower electrode through said central
4 opening.

1 26. The memory of claim 24 including a base layer
2 between said substrate and said lower electrode.

1 27. The memory of claim 26 wherein said base layer is
2 conductive.

1 28. The memory of claim 24 wherein said lower
2 electrode includes carbon.

1 29. The memory of claim 24 wherein said protective
2 film is an electrical insulator.

1 30. The memory of claim 29 wherein said protective
2 layer includes a material in the form Si_xN_y .